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(54) Title: METHOD FOR DETERMINATION COOKING CONDITIONS AND SYSTEM FOR DETERMINATION COOKING CONDITIONS

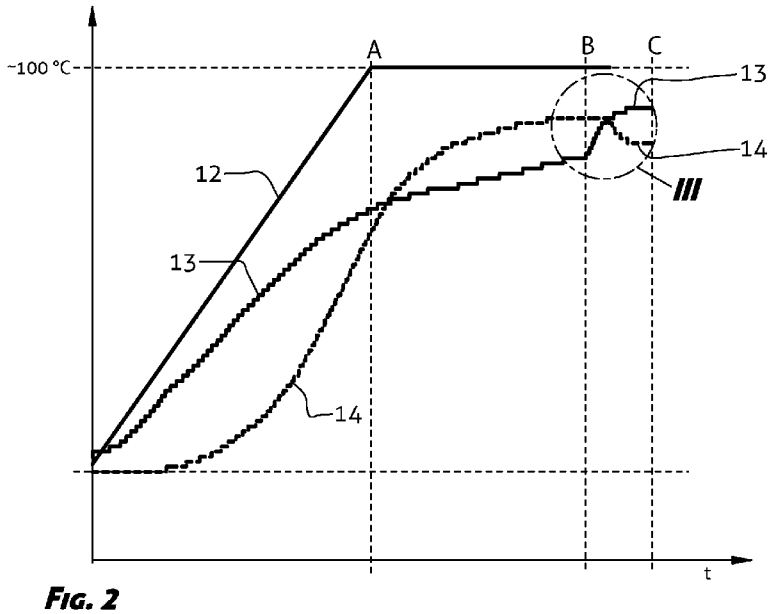

FIG. 2

(57) Abstract: The present invention refers to a method for determination cooking conditions, preferably a household cooking, and to a system for determination said cooking conditions. Said system comprises at least one external probe (8) which is preferably arranged on a lid (6) of a cooking pot (5), at least one additional internal probe (7) which is preferably arranged in the immediate vicinity of a heating body (2) inside a cooking apparatus (1), and a control unit (4) which is preferably arranged inside said cooking apparatus (1).

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Method for determination cooking conditions and system for determination cooking conditions

The present invention refers to a method for determination cooking conditions, preferably a household cooking, and to a system for determination said cooking conditions.

When cooking food both the manufacturers of the cooking apparatuses and the users thereof face the enduring problem that the water, for any reason whatsoever, entirely boils away from the pot where the food is prepared, so that the food remains practically dry within the pot. As a result, the food gets burnt and if the user does not react in time a fire may start resulting in a destruction of the cooking apparatus and, potentially, the entire kitchen as well. The solution to said problem is a method of a self-controlled cooking, and a system and/or a method of energy control of the cooking apparatus during cooking, which controls and automatises the cooking process.

A device for power control is disclosed in the patent No. DE 38 11 925 C1, where a temperature sensor is integrated within the cooking plate. A heater is switched on/off by means of said sensor. A problem arises in the case when the water boils away from the pot, where the food is cooked. The temperature of the heater does not increase fast enough in order for said temperature sensor to sense dangerous conditions and to switch the heater off.

Furthermore, a solution is disclosed in the patent No. DE 196 38 355 C2, which is based on sensing the noise of boiling in the pot where the food is cooked. By analysing the relative amplitudes of the noise at different frequencies, the control system can differentiate between simmering and boiling. The bubbles generated at the bottom of the pot generate different frequencies of noise to those bursting at the surface of the liquid when boiling. The control system monitors low frequencies and high frequencies, which are separated by filter circuits to two levels of noise. The amplitude values are calculated for each frequency range, on the basis of which it can be determined the type of boiling, energy, etc. Such frequency analysis requires a relatively sophisticated computer capabilities and, as a result, relatively high costs for integration into the cooking pot.

It is the object of the present invention to create a simple method for determination of

conditions for cooking food in a pot, preferably in a household pot, which remedies drawbacks of the known solutions.

Additional object of the present invention is to create a system for carrying out a method for determination of conditions for cooking food in a pot, preferably in a household pot.

The object as set above is solved with characteristics as set forth in claim 1. Details of the invention are disclosed in subclaims. It is provided for, according to the present invention, that a system for determination cooking conditions comprises at least one internal temperature probe, preferably arranged in the immediate vicinity of a heating body inside a cooking apparatus. Optionally, at least one additional temperature probe is arranged on a cooking pot lid. A control unit is arranged inside the cooking apparatus, which on the basis of the data from at least one temperature probe controls the power supply into the heating body of the cooking apparatus. Said temperature probe measures a first parameter on the cooking pot and a second parameter on the heating body of the cooking apparatus. Based on the change of parameters and, respectively, the sum or the difference of said parameters the control unit of the cooking apparatus triggers an adequate pre-determined action.

The invention is further described in detail by way of non-limiting preferred embodiment, and with a reference to the accompanying drawing, where

Fig. 1 shows a schematic view of a system according to the invention,
Fig. 2 shows a graphical representation of the temperature development during cooking according to the invention,
Fig. 3 shows a detail **III** of Fig. 2.

Fig. 1 shows a schematic view of a system for determination cooking conditions according to the invention. Said system is comprised of a cooking apparatus 1, comprising a heating body 2 arranged, for instance, under a glass-ceramic plate 3 of the cooking surface of said cooking apparatus 1, a control unit 4, a cooking pot 5 with a lid 6, said cooking pot 5 being placed on said cooking surface, and at least one first temperature probe 7. Optionally, the system according to the invention may also comprise at least one second temperature probe 8. Each temperature probe 7, 8 is linked via data lines 9, 10 with said control unit 4. In addition, said heating body 2 is linked via a data line 11 with said control unit 4. Here, each said data line 9, 10, 11 is formed either as a wired line or as a wireless line. According to

the invention, said first temperature probe 7 is arranged in the immediate vicinity of said heating body 2, such as for example in the central area thereof or in the marginal area thereof. According to the invention, said second temperature probe 8 is arranged on said lid 6 of the cooking pot 5. One of the embodiments provides for that said second temperature probe 8 is arranged in a handle of said lid 6, whereas the second, preferred embodiment provides for that said second temperature probe 8 is formed as a removable element which can be connected to said lid 6 by means of a magnetic bond, for example.

The present invention is based on the idea that during cooking process of the food in the cooking pot 5, it can be reasoned of the condition in said cooking pot on the ground of the temperature measurements on the heating body 2 of the cooking apparatus 1 and, optionally, on the lid 6 of the cooking pot 5, and mutual relationship of said temperatures. Fig. 2 shows a graphical representation of an approximate temperature development during cooking of food in the cooking pot 5. It is assumed, that said cooking pot 5 contains a regular amount of the food to be cooked and a regular amount of the water to cook said food. The first curve 12 in Fig. 2 represents a temperature development during heating up of the water along with the food. During uninterrupted power supply from said heating body 2 to said pot 5, said water heating temperature increases approximately linearly until the water starts to boil at approximately 100 °C, as represented by point **A** in Fig. 2. From said point on, the water temperature remains approximately constant as long as there is still some water in the pot 5, as represented by point **B** in Fig. 2. The second curve 13 in Fig. 2 represents a temperature development in said heating body 2, whereas the third curve 14 represents a temperature development on said lid 6 of the pot 5.

If after reaching the point **A** the quantity of the energy supplied to the cooking pot 5 is not lowered, the entire volume of the water contained in said cooking pot 5 evaporates, and the temperature development in Fig. 2 reaches said point **B** at the time when the water completely ran out of the cooking pot. If the heat is supplied from said heating body 2 to the cooking pot 5 after the cooking pot 5 completely ran out of the water, the temperature of the heating body 2 sharply increases. Simultaneously, the temperature of said lid 6 sharply decreases, since there is no media left in the area below the lid 6 that would effectively transfer heat to the lid 6, after the cooking pot completely ran out of the water (cf. point **B** in Fig. 2 and Fig. 3). Therefore, the invention proves that approximately at the moment when the cooking pot 5 completely ran out of the water and, respectively, after expiration of a certain pre-determined time *t* from the moment when the temperature on the

lid 6 decreases, i.e. at the point B in Fig. 2, said first temperature probe 7 at the heating body 2 senses a sudden temperature increase ΔT_2 of the heating body 2, whereas said second temperature probe 8 senses sudden temperature decrease ΔT_1 on the lid 6. Said temperature probes 7, 8 send via said data lines 9, 10 information about the temperature decrease ΔT_1 and the temperature increase ΔT_2, respectively, to said control unit 4 which, based on stored values of allowed temperature decrease and/or temperature increase and/or the sum of the temperature decrease and the temperature increase of the heating body 2 and/or the lid 6, in turn switches off via data line 11 the power supply to said heating body 2, resulting in the immediate stop of the cooking process.

In a manner as described in the foregoing safe cooking is achieved, since in the case when the user for any reason whatsoever forgets about the pot with the food on the switched-on cooking apparatus, said system automatically switches-off the cooking apparatus, thus, preventing reliably for the food to be burnt in the cooking pot, or even for the fire to start due to uncontrolled power supply.

The method and the system according to the present invention are particularly suitable for use with the cooking in a household and, respectively, for food preparing. However, the system according to the invention is well applicable everywhere, where water is used for the cooking which may reach the boiling point, and where the power supplied to the cooking pot is automatically controlled. In addition, the use of the present invention is not limited to the household only, but can be applied, for example, to the area of boilers and other apparatuses for heating up liquids, and inter alia to control the solid to liquid phase change.

Claims

1. System for determination cooking conditions, ***characterized in that*** it comprises at least one probe (7; 8) arranged either in the immediate vicinity of a heating body (2) inside a cooking apparatus (1) or on a lid (6) of a cooking pot (5), and a control unit (4) preferably arranged inside cooking apparatus (1).

2. System according to claim 1, ***characterized in that*** said exterior probe (7; 8) is linked via data line with said control unit (4).

3. System according to claim 1, ***characterized in that*** said probe (7; 8) is a temperature probe.

4. System according to claim 1, ***characterized in that*** the internal temperature probe (7) is arranged in the immediate vicinity of the heating body (2) of the cooking apparatus (1), and the external temperature probe (8) is arranged on said lid (6).

5. Method for determination cooking conditions, ***characterized in that*** it comprises
   a) measuring a first parameter with said probe (7; 8) on said cooking pot (5),
   b) measuring a second parameter with said probe (7; 8) on said heating body (2) of said cooking apparatus (1),
   c) in case of the decrease of the first parameter, summation in the control unit (4) of the decrease of the first parameter with the increase of the second parameter,
   d) comparing the sum of the decrease of the first parameter with the increase of the second parameter to a pre-determined value stored in the control unit (4),
   e) switching-off the heating body (2) of the cooking apparatus (1), if the sum of the decrease of the first parameter with the increase of the second parameter equals or exceeds a pre-determined value stored in a control unit (4).

6. Method for determination cooking conditions according to claim 5, ***characterized in that*** it comprises
   a) measuring a first temperature with said temperature probe (7; 8) on said cooking pot (5),
   b) measuring a second temperature with said temperature probe (7; 8) on said heating body (2) of said cooking apparatus (1),

c) in case of the temperature decrease ΔT_1 on the lid (6) of the cooking pot (5), summation in the control unit (4) the temperature decrease ΔT_1 with the increase ΔT_2 of the second temperature,

d) comparing the sum of the temperature decrease ΔT_1 on the lid (6) of the cooking pot (5) with the temperature increase ΔT_2 on the heating body (2) to the pre-determined value stored in the control unit (4),

e) switching-off the heating body (2) of the cooking apparatus (1), if the sum of said temperature decrease ΔT_1 with said temperature increase ΔT_2 equals or exceeds a pre-determined value stored in a control unit (4).

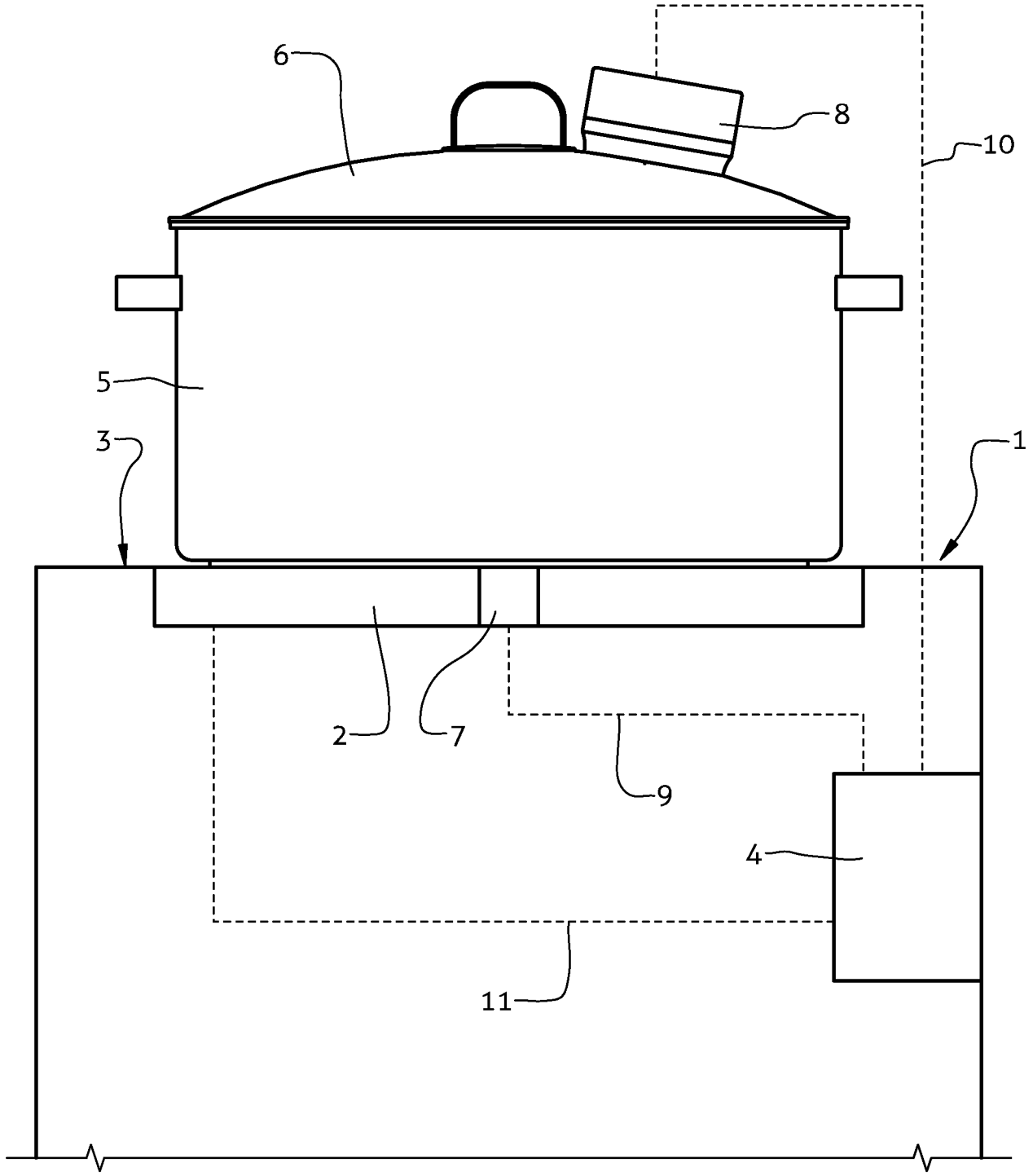

FIG. 1

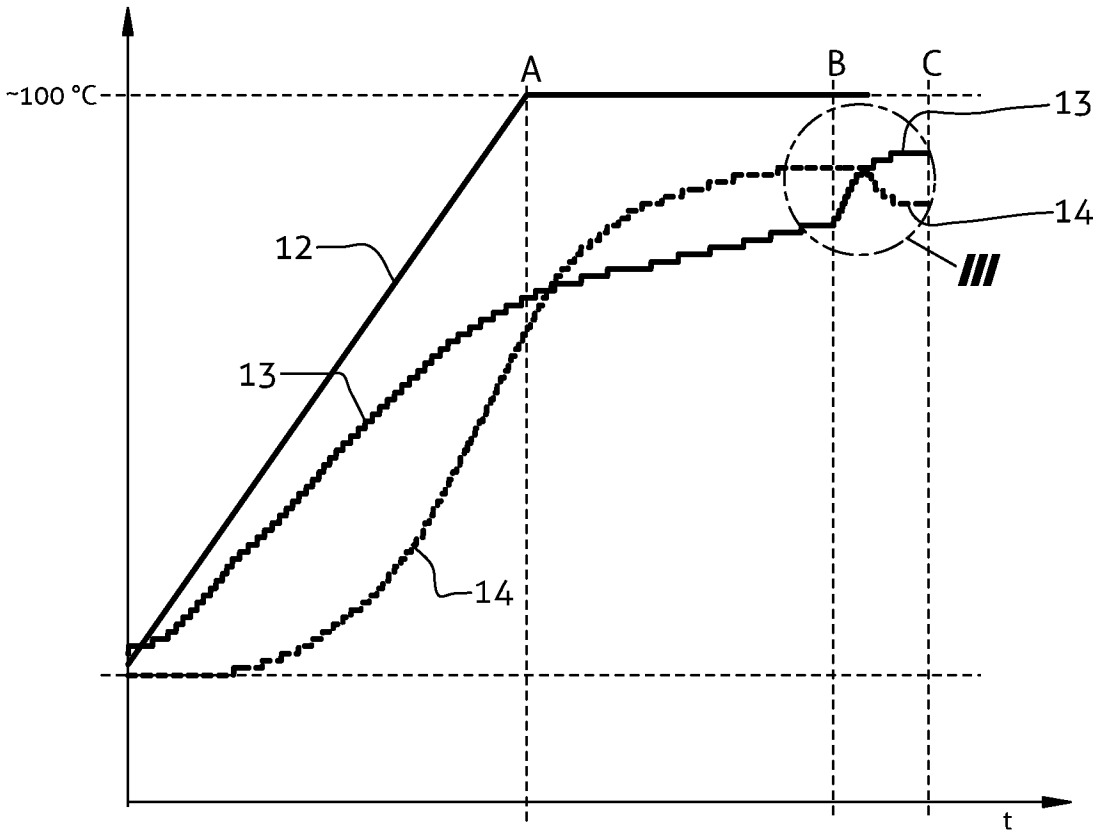

FIG. 2

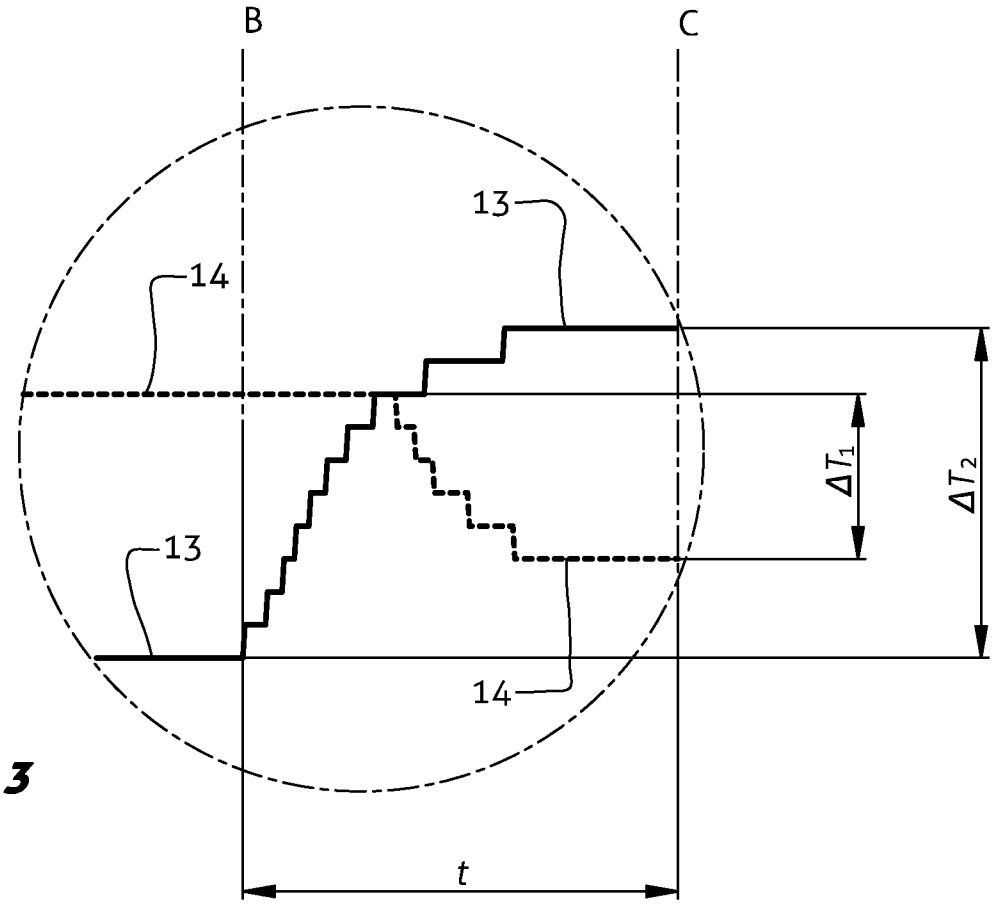

FIG. 3

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2013/051927

A. CLASSIFICATION OF SUBJECT MATTER
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ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H05B A47J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, INSPEC, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 1 525 831 A1 (BSH BOSCH SIEMENS HAUSGERAETE [DE]) 27 April 2005 (2005-04-27) paragraphs [0002], [0020] - [0023], [0027] - [0032]; figures 1,3	1-4
A	EP 1 699 332 B1 (KOVACS LASZLO [HU]) 13 February 2008 (2008-02-13) paragraphs [0001], [0004], [0010] - [0014]; claim 1; figures 1,2	1-6
A	NL 1 000 643 C1 (NEDAP NV [NL]) 24 December 1996 (1996-12-24) abstract; figure 1	1-6

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
30 July 2013	06/08/2013

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
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